

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. (Previously Presented) Apparatus for ultrasound imaging comprising : a signal generator; a transmit transducer coupled to the signal generator for simultaneously irradiating a target with a relatively low frequency ultrasound conditioning signal and a relatively high frequency ultrasound detection signal ; a receive transducer for receiving echo signals from the target; and a signal processor adapted to process the received echo signals to detect the presence of first structures within the target causing a first magnitude of detection signal echo arising from periods when the conditioning signal is in a first phase and a second, different, magnitude of detection signal echo arising from periods when the conditioning signal is in a second phase.
2. (Previously Presented) The apparatus of claim 1 in which the signal processor is adapted to process the received echo signals so as to differentiate said first structures within the target whose physical properties change as a function of the conditioning signal from second structures whose corresponding physical properties remain substantially invariant in response to the conditioning signal.
3. (Currently Amended) The apparatus of claim 1 ~~or claim 2~~ in which the conditioning signal has a frequency in the range 10 kHz to 5 MHz.
4. (Previously Presented) The apparatus of claim 3 in which the conditioning signal has a frequency in the range 100 kHz to 800 kHz.
5. (Previously Presented) The apparatus of any one of claims 1 to 4 in which the detection signal has a frequency in the range 1 MHz to 50 MHz.

6. (Currently Amended) The apparatus of claim 5 in which the detection signal ~~has a~~ has a frequency in the range 1 MHz to 5 MHz.

7. (Currently Amended) The apparatus of any one of claims 1 to 4 or claim 6 in which the signal processor is adapted to determine the response of the first structures to the detection signal during positive and negative cycles of the conditioning signal.

8. (Currently Amended) The apparatus of any one of claims 1 to 4 or claim 6 in which the signal generator and transmit transducer are adapted to produce a first excitation signal pulse and successively a second excitation signal pulse that is a phase-inverted replica of the first excitation signal pulse; and in which the signal processor includes means for processing the received echo signals to determine the response of the first structures to the first and second excitation signal pulses.

9. (Previously Presented) The apparatus of claim 8 in which the first and second excitation signal pulses comprise the conditioning signal.

10. (Currently Amended) The apparatus of claim 8 ~~or claim 9~~ in which the first and second excitation signal pulses comprise the detection signal.

11. (Currently Amended) The apparatus of any ~~preceding claim~~ one of claims 1 to 4, 6, 9 and 10 in which the transmit transducer is adapted to transmit at least a first excitation pulse and a second excitation pulse each including a said conditioning signal frequency and a said detection signal frequency, the second excitation pulse being a phase inversion of the first excitation pulse; and in which the signal processor comprises a pulse inversion processor for determining a difference between an echo signal from the first excitation pulse and an echo signal from the second excitation pulse.

12. (Currently Amended) The apparatus of any preceding claim ~~1 to 10~~one of claims 1 to 4, 6, 9 and 10 in which the transmit transducer is adapted to transmit at least a first excitation pulse and a second excitation pulse each including a said conditioning signal frequency and a said detection signal frequency, the second excitation pulse being a phase shifted version of the first excitation pulse; and in which the signal processor comprises a correlation processor for determining a difference between at least portions of an echo signal from the first excitation pulse and an echo signal from the second excitation pulse.

13. (Currently Amended) The apparatus of any preceding claim ~~one of claims 1 to 4, 6, 9 and 10~~ further including an image display system adapted to indicate locations of the first structures within the target.

14. (Previously Presented) The apparatus of claim 2 further including an image display system adapted to indicate relative locations of the first and second structures within the target.

15. (Currently Amended) The apparatus of any preceding claim ~~one of claims 1 to 4, 6, 9, 10 and 14~~ in which the signal processor is adapted to process one or more harmonics of the received echo signal.

16. (Previously Presented) A method of ultrasound imaging comprising the steps of : simultaneously irradiating a target with a relatively low frequency ultrasound conditioning signal and a relatively high frequency ultrasound detection signal; receiving echo signals from the target; and processing the received echo signals to detect the presence of first structures within the target causing a first magnitude of detection signal e_1 arising from periods when the conditioning signal is in a first phase and a second, different, magnitude of detection signal e_2 arising from periods when the conditioning signal is in a second phase.

17. (Previously Presented) The method of claim 16 wherein the step of processing the received echo signals is adapted to differentiate said first structures within the target whose physical properties change as a function of the conditioning signal from second structures whose

corresponding physical properties remain substantially invariant in response to the conditioning signal.

18. (Currently Amended) The method of claim 16 ~~or claim 17~~ in which the first structures are contrast agent structures, and including the step of introducing the contrast agent structures into selected locations of the target.

19. (Previously Presented) The method of claim 18 in which the contrast agent structures are bubbles of fluid.

20. (Previously Presented) The method of claim 19 in which the contrast agent structures are bubbles of gas.

21. (Previously Presented) The method of any one of claims 16 to 20 in which the physical property of the first structures that changes in response to the conditioning signal is a. size of each of the first structures.

22. (Currently Amended) The method of ~~claim 21 when dependent from any one of~~ claim 18 or ~~claim 19 in which the physical property of the first structures that changes in response to the conditioning signal is a. size of each of the first structures and~~ in which a physical property of the first structures that changes in response to the conditioning signal is a resonant frequency.

23. (Currently Amended) The method of any one of claims 16 to ~~22-20~~ in which the conditioning signal has a frequency in the range 10 kHz to 5 MHz.

24. (Previously Presented) The method of claim 22 in which the conditioning signal has a frequency in the range 100 kHz to 800 kHz.

25. (Currently Amended) The method of any one of claims 16 to ~~24-20 and 24~~ in which the detection signal has a frequency in the range 1 MHz to 50 MHz.

26. (Previously Presented) The method of claim 25 in which the detection signal has a frequency in the range 1 MHz to 5 MHz.
27. (Currently Amended) The method of any one of claims 16 to ~~26-20, 24 and 26~~ in which the step of processing the received echo signals comprises the step of determining the response of the first structures to positive and negative cycles of the conditioning signal.
28. (Currently Amended) The method of any one of claims 16 to ~~26-20, 24 and 26~~ in which the step of processing the received echo signals comprises the step of determining the response of the first structures to a first excitation signal pulse and to a successive second excitation signal pulse that is a phase-inverted replica of the first excitation signal pulse.
29. (Previously Presented) The method of claim 28 in which the first and second excitation signal pulses comprise the conditioning signal.
30. (Currently Amended) The method of ~~claim 28 or claim 29~~ in which the first and second excitation signal pulses comprise the detection signal.
31. Cancelled.